Research Methods

Recruitment of Hospitals for a Safety Climate Study: Facilitators and Barriers

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Promoting a culture of safety has become a key tenet of the patient safety movement. Moving away from a "shame and blame" culture to one that "treats errors not as personal failures, but as opportunities to improve the system and prevent harm"[1(p. 79)] is critical to improving patient safety.[2] Interest in promoting a culture of safety necessitates assessment tools that accurately measure hospital safety culture.[2–4] Much research during the past five years has addressed the development and use of employee surveys to measure the safety "climate" of organizations,[5–16] surface features of the underlying safety cultures of an organization discerned from workers' attitudes and perceptions.[3,17]

Implementing a safety climate assessment for research purposes requires a hospital to commit time and resources to obtain buy-in from key stakeholders, apply for Institutional Review Board (IRB) approval, and secure support from local or national unions.[2] Given these potential obstacles, not all health care organizations participate in research studies of safety climate. However, there is little research about the process of recruiting hospitals or the factors that may facilitate or impede a hospital's willingness to participate in such studies.[2]

This article describes the recruitment of a sample of Department of Veterans Affairs (VA) hospitals into a study assessing safety climate. The study addresses the following questions:

1. Are hospitals that are willing to participate and easiest to recruit in a study of safety climate preferentially those with the best performance on indicators of patient safety?

2. Is participation more strongly related to hospital-level factors or to characteristics of the recruitment process itself?

We have two specific hypotheses:

H1: Higher-performing facilities (with lower scores on indicators of patient safety) will be more easily recruited, while lower performers (with higher scores on indicators of patient safety) will be more challenging to recruit.[18,19]

H2: Hospitals with a more entrepreneurial culture will be more easily recruited because of their orientation toward risk

Article-at-a-Glance

Background: Despite increasing emphasis on safety culture assessment, little is known about the factors that affect hospitals' participation in such studies. Factors affecting recruitment of 30 Department of Veterans Affairs (VA) hospitals into a study to evaluate perceptions of safety culture, or safety "climate," were examined.

Methods: To minimize selection bias, hospitals were recruited that represented the spectrum of safety performance on the basis of Patient Safety Indicator scores. Invitations and additional mailings, informational conference calls, and personal contact with hospitals were used to encourage participation. Investigators worked closely with hospitals' key stakeholders to obtain support and buy-in for the study. Relationships among safety performance, organizational culture, and other hospital characteristics with hospitals' participation and ease of recruitment were examined. Findings were compared with those of a companion study in the non–VA setting.

Results: Despite attempts to optimize recruitment, it was necessary to contact more than 90 hospitals to obtain a 30-hospital sample. Having a more entrepreneurial culture (associated with risk-taking, innovation, and quality improvement) was significantly related to shorter recruitment time in VA and non–VA settings. Safety performance was significantly related to participation in the VA (that is, "better-performing" hospitals were more likely to be recruited than "lower-performing" hospitals), but not in the non–VA study, where recruitment was based on size and region.

Discussion: Researchers should recruit representative samples of hospitals based on measures of safety performance. Hospital selection bias could lead to erroneous findings, ultimately impeding efforts to improve safety within organizations.

taking, innovation, and quality improvement (QI),[20] while hospitals with more bureaucratic and rational cultures will be more challenging to recruit because of their emphasis on formal policies, planning, and goal setting.

This case study provides insights for motivating hospitals that are less interested in participating in safety-related studies to do so. It may also encourage leaders of "lower-performing" hospitals to engage more actively in patient safety research.

Methods

Overall Recruitment Strategy

In 2005 we sought to recruit 30 VA hospitals to participate in the study. This number seemed manageable for recruiting hospitals but was large enough to allow us to generalize results to all VA hospitals.[18,19] We implemented special measures to minimize selection bias (that is, to ensure that high-performing hospitals were not the only ones participating in our study) and to ensure that we recruited hospitals along the entire spectrum of safety performance. Our recruitment methodology consisted of the following steps:

- From the population of all 117 VA acute care hospitals, we created 4 similar-sized groups of hospitals on the basis of performance. We used the Agency for Healthcare Research and Quality's (AHRQ) Patient Safety Indicators (PSIs)—indicators developed to capture potentially preventable events that compromise inpatient safety[21]—to classify hospitals as high, medium, low, or other performers (see Appendix 1 [page 282] for details on ranking hospitals by their PSI scores).
- Within each performance group, we randomly ordered hospitals and recruited down the list until we obtained seven to eight hospitals from each group.

Recruitment Process in Detail

Before hospital selection, the research team [the authors] obtained union and IRB approval. To participate, hospitals had to agree to administer the Patient Safety Climate in Healthcare Organizations (PSCHO) survey twice, 18 months apart, each involving up to three anonymous waves of mailings, to a large subset of their personnel (100% of attending physicians and senior managers and a 10% random sample of all other employees). This instrument was developed by members of our team to measure workers' perceptions and attitudes about safety climate in their institutions.*

Although survey mailings were prepared by a contract firm, hospital effort was required to disseminate survey packets. Each hospital assigned at least one person (typically the patient safety manager) as the project coordinator responsible for study tasks. The following specific benefits and incentives were offered to encourage hospital participation:

- Provision of hospital-specific and aggregated safety climate results from the study
- Informational conference calls discussing survey results and other patient safety topics
- Assurance that hospital-specific results would be provided only to each hospital itself
- Access to our project Web site containing links to patient safety resources and articles
- Inclusion in a Patient Safety Consortium listserve, developed by our AHRQ–funded companion study,[19,20] which provides patient safety information and sponsors an annual meeting

The flow of our recruitment process is depicted in Figure 1 (page 277). We sent personalized e-mail messages to the directors of all 117 acute care VA hospitals inviting their participation in the study. An informational package designed to encourage study participation was attached. It contained (1) a brochure outlining study goals and benefits of participation, (2) a letter of support from selected Veterans Integrated Service Network leaders, and (3) an executive summary of the study plan. We sent this package in three separate "mail blasts" from September to December 2005. Additional letters of support were sent to hospital directors by a senior leader at The Joint Commission. Because the Joint Commission's participation in the companion study helped to boost recruitment, we solicited their informal assistance in our study. We also made follow-up calls and sent e-mails to encourage hospitals to participate.

We held conference calls throughout the recruitment period to answer questions about the study.

We sent all hospitals that indicated potential interest a package of material containing the following:

1. Publications on patient safety authored by research team members
2. A hospital agreement letter outlining what the project would provide to facilities and what was required of them
3. A copy of the exempt approval certification from our IRB
4. A template that hospitals could use to prepare submissions for IRB and research and development (R&D) committee approvals at their sites
5. A letter to local union leaders requesting their support
6. A sampling plan detailing the number and type of personnel who would participate in the survey

For facilities that vacillated about participation, we offered

* The 48-item Patient Safety Climate in Healthcare Organizations survey may be obtained from the authors by e-mail request.

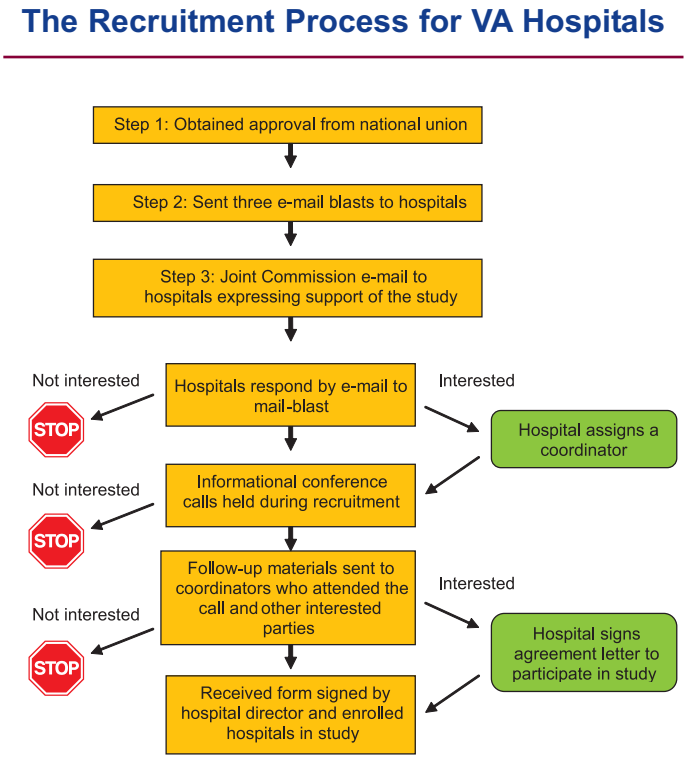

Figure 1. *The flowchart depicts the process for recruitment of Department of Veterans Affairs (VA) hospitals.*

to assist with their IRB and R&D applications. Twelve hospitals accepted this offer.

Hospitals' agreement to participate was established on receipt of their signed agreement letters. We assigned an incremental accession number to each participating institution in the order that its letter was received.

Data Sources and Variables

Hospital characteristics that we expected to be associated with recruitment, safety, or quality[22–29] were derived from a variety of sources. Information on hospitals' teaching status, bed size, and region was obtained from the 2002 American Hospital Association (AHA) Annual Survey of Hospitals.[30] Information on hospitals' organizational culture was obtained from the 2004 VA All Employee Survey (AES), which included a modified version of the Zammuto and Krakower (Z&K) instrument based on the competing values framework.[31] This Z&K portion contained multi-item scales representing four dimensions of organizational culture: "entrepreneurial," "group-oriented," "bureaucratic," and "rational/production-oriented." Scale scores ranged from 1–5, with higher scores indicating a higher perceived level of that characteristic at the facility. We included two other measures from the AES as indirect markers of hospital safety orientation: (1) a multi-item scale measuring employees' perception of worker safety at their hospital and (2) a single-item measure of general job satisfaction.

Hospitals' safety performance was based on PSI rankings (high, medium, low, and other). The PSIs use algorithms that incorporate diagnostic, demographic, and procedural information from individual hospitalizations.[32–34] The VA Patient Treatment File, an inpatient discharge file, was used as input to the PSI software to obtain PSI rates.

Analyses

We explored characteristics of recruited hospitals and compared them with characteristics of nonrecruited hospitals and of all VA acute care facilities. We examined the number of working days that elapsed between the date we first contacted a hospital director (mail-blast date) and the date when the director signed the participation agreement letter (recruitment time). Using the median number of days for recruitment as the cutoff point, we divided hospitals into two recruitment groups: a "quick group" and a "slow group." To determine whether any hospital characteristics were significant predictors of recruitment time, we ran a generalized linear model (GLM) with recruitment time as a continuous dependent variable. In addition to hospitals' safety performance and organizational culture measures, we included bed size, teaching status, and geographic region as covariates in the model. We also examined whether estimated mean recruitment times and 95% confidence intervals (CIs) were significantly different among each group of hospital characteristics.

To assess the generalizability of our results, we compared our findings to those of a companion AHRQ study, which concurrently assessed safety climate in non–VA hospitals nationwide[18,19] using the PSCHO.[18,19,35]

Results

As shown in Figure 2 (page 278), the first mail blast was sent to 46 of the 117 hospitals; we randomly selected 12 hospitals from each of the high, medium, and low performance groups and 10 from the other group. This mail blast successfully recruited 17 facilities (57% of the sample), with nearly as many from the high group as from the remaining groups combined. Subsequent recruitment efforts focused on the low, medium, and other groups.

The second mail blast yielded 10 additional hospitals: 3 from the medium group; 2, low; and 5, other. We recruited 3

Department of Veterans Affairs (VA) Sampling Process and Recruitment Results by Mail Blast

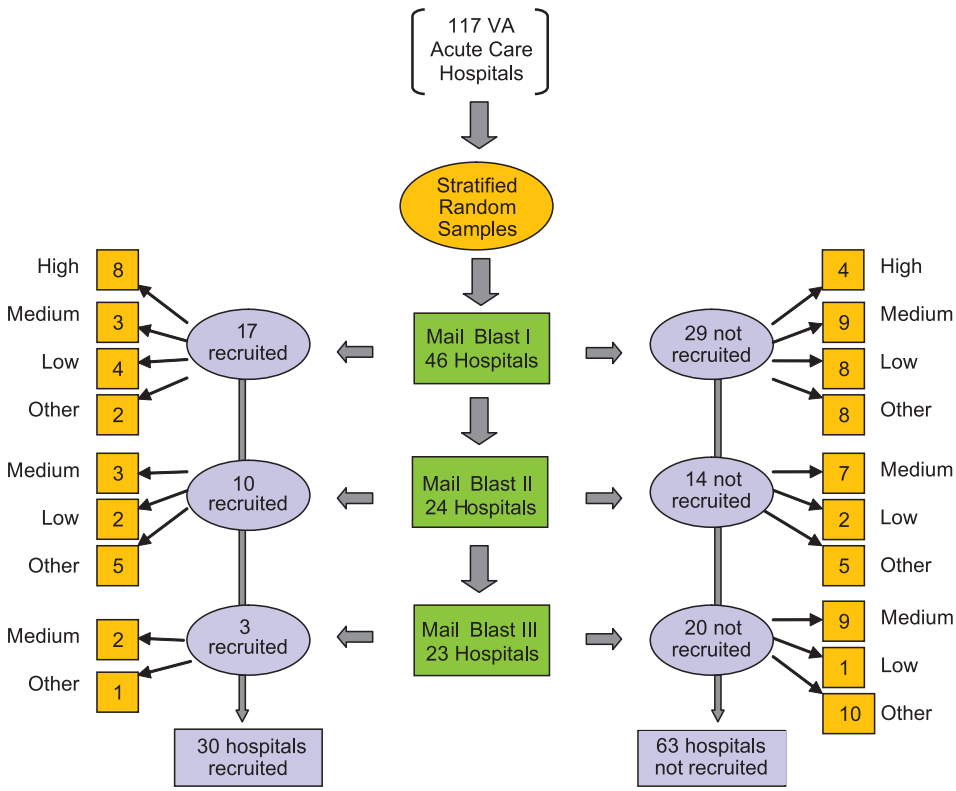

Figure 2. *The flow chart depicts the number of VA hospitals by mail blasts and performance that were recruited and not recruited.*

hospitals from our third and final effort; 2, medium; and 1, other. Our final collection of participating hospitals included 8 from each of the high, medium, and other groups, and 6 from the low group. This represented 47% of high-performing hospitals, 24% of the medium performers, 35% of the low performers, and 16% of the other group from the original recruitment universe.

Reasons for Nonparticipation

Of the 93 hospitals invited to participate, 63 (79.5%) did not enroll. Thirty-one hospitals (49%) initially considered participating but declined because of lack of staff time or management support, IRB issues, and concerns related to employee survey fatigue. Twenty-six of these (41%) were simply nonresponsive to our contacts. Three hospitals (5%) were interested but never gave a final decision to participate, and three hospitals (5%) wanted to participate but gave us their decision after the quota for their group had been reached.

Characteristics of Recruited Versus Nonrecruited Hospitals

Recruited and nonrecruited hospitals differed in hospital safety performance and region (Table 1, page 279). The recruited sample contained a higher percentage of high performers (hospitals with lower PSI rates) than the nonrecruited sample and a lower percentage of "other" hospitals. Participants included a higher percentage of hospitals from the East compared with nonparticipants and fewer hospitals from the South. No significant differences were observed between participating and nonparticipating hospitals in teaching status, size, or any of the six AES measures.

We compared risk-adjusted PSI rates between participating sites and all VA hospitals. There were no significant differences, reassuring us that our sample of hospitals was representative of all VA hospitals on safety performance.* Similarly, participating

* The comparison of PSI values for participating sites and all VA hospitals may be obtained from the authors by e-mail request.

Table 1. Recruitment by Hospital Characteristics (Department of Veterans Affairs [VA] Sample)*

	Recruited Hospitals *n* = 30 (32.26%)	Hospitals Not Recruited *n* = 63 (67.74%)	VA All *n* = 117 (100.0%)
Hospital Performance†			
	8 (26.67%)	4 (6.35%)	17 (14.53%)
Medium Performance	8 (26.67%)	25 (39.68%)	33 (28.21%)
Low Performance	6 (20.00%)	11 (17.46%)	17 (14.53%)
Other	8 (26.67%)	23 (36.51%)	50 (42.74%)
Teaching Status			
Major	16 (53.33%)	31 (49.21%)	58 (49.58%)
Minor	8 (26.67%)	16 (25.40%)	29 (24.79%)
Nonteaching	6 (20.00%)	16 (25.40%)	29 (24.79%)
Bed Size			
Large (250 beds and over)	15 (50.00%)	31 (49.21%)	56 (47.86%)
Medium (100–249 beds)	9 (30.00%)	24 (38.10%)	43 (36.75%)
Small (20–99 beds)	6 (20.00%)	8 (12.70%)	17 (14.53%)
Region†			
East	12 (40.00%)	7 (11.11%)	20 (17.09%)
Midwest	7 (23.33%)	13 (20.63%)	25 (21.37%)
South	6 (20.00%)	32 (50.79%)	46 (39.32%)
West	5 (16.67%)	11 (17.46%)	25 (21.37%)
All Employee Survey (AES) Measures: Mean (standard deviation)			
Group Culture	2.94 (0.17)	2.90 (0.17)	2.91 (0.17)
Entrepreneurial Culture	2.78 (0.17)	2.76 (0.15)	2.76 (0.16)
Bureaucratic Culture	3.44 (0.06)	3.44 (0.07)	3.44 (0.07)
Rational Culture	3.26 (0.15)	3.24 (0.13)	3.24 (0.13)
Employee Safety Orientation	3.72 (0.13)	3.71 (0.13)	3.72 (0.13)
Overall Job Satisfaction	3.83 (0.10)	3.83 (0.12)	3.83 (0.11)
Mail-Blast Number			
First, sent 9/14/05	17 (56.67%)	29 (46.03%)	—
Second, sent 10/17/05	10 (33.33%)	14 (22.22%)	—
Third, sent 12/07/05	3 (10.00%)	20 (31.75%)	—

* Note: There were no significant differences between recruited hospitals and all VA hospitals.
Teaching status: Major teaching, Council of Teaching Hospitals (COTH) membership; minor teaching, Accreditation Council for Graduate Medical Education (ACGME) accreditation only; nonteaching, neither major nor minor teaching status.
Hospital Performance: Four groups (high, medium, low, and other) were generated based on the rankings of average Patient Safety Indicator rates on two factors (complications and general medical/surgical care).
Organizational culture domains were measured on a scale of 1–5, with 5 indicating a higher perceived level of that characteristic.
Employee safety orientation: employee perception of concern about employee safety at the organization, rated on a scale of 1–5.
Overall job satisfaction: current overall satisfaction with the job, rated on a scale of 1–5.
† $p < .05$ between recruited and nonrecruited hospitals.

hospitals did not differ from other VA hospitals on any of the AES measures.

Characteristics Related to Recruitment

Mean recruitment time was 18.9 days (standard deviation [SD], 10.8; range, 4–44 days). There were no significant differences between the quick and slow recruitment groups on any hospital characteristics, although we observed some trends (Figure 3, page 281). The lowest mean recruitment times occurred in hospitals that were "medium performers" on PSI rankings (mean recruitment time, 15 days) compared with hospitals in the high performance group (18 days), low group (22 days), and other group (21 days). Lower mean recruitment times were associated with location in the Midwest, smaller facility size, and nonteaching status.

When we adjusted for all the hospital characteristics in the

Table 2. Hospital-Level Characteristics Associated with Recruitment Time in the Department of Veterans Affairs (VA)

	Estimate	Standard Error	*p* Value
Performance			
High Performance	-7.371	6.72	.29
Medium Performance	0.81	6.60	.91
Low Performance	-0.03	6.25	1.00
Other (reference group)			
Teaching Status			
Major	-8.42	7.94	.31
Minor	-10.11	7.86	.22
Nonteaching (reference group)			
Bed Size			
Small (20–99 beds)	-5.61	6.55	.41
Medium (100–249 beds)	0.23	5.58	.97
Large (≥ 250 beds) (Reference group)			
Region			
Region-East	-0.45	5.87	.94
Region-Midwest	-14.59	6.89	.05
Region-South	-1.58	7.67	.84
Region-West (Reference group)			
All Employee Survey (AES) Measures			
Group Culture†	118.87	37.11	.01
Entrepreneurial Culture†	-98.46	43.12	.04
Bureaucratic Culture	-23.49	46.11	.62
Rational Culture	26.05	49.90	.61
Employee Safety Orientation	-47.99	37.51	.23
Overall Job Satisfaction (item 12)	-39.72	50.48	.45

* A regression model was run addressing hospital characteristics and recruitment time: $R^2 = 0.72$, $F = 1.97$, $p = .12$.
† $p < .05$.

model, hospitals in the Midwest continued to have the shortest recruitment time (Table 2, above). The only other variables significantly related to recruitment time were group and entrepreneurial culture. While entrepreneurial culture was associated with shorter recruitment time, group-oriented culture was related to longer recruitment time.

Despite efforts to stratify by region, the AHRQ companion study also recruited a higher percentage of hospitals from the East and fewer hospitals from the South. Contrary to our results, the AHRQ study found that low-performing hospitals were quickest to recruit after controlling for hospital-level covariates. When this was explored further, hospital size was found to be an important confounder. Small hospitals (compared with other sizes) had better safety performance, but they took longer to recruit than larger hospitals with worse safety performance. As in the VA study, entrepreneurial culture was significant and negatively related to recruitment time.

Discussion

Although we attempted to optimize recruitment by involving key stakeholders, providing incentives, showing support from a Joint Commission executive, and following established data collection procedures and survey methods,[2,12] it was necessary for us to contact about 80% of all VA hospitals in a complex set of efforts to achieve our desired sample. It was difficult to recruit hospitals even though this study involved only minimal risk. Hospitals might have perceived that participation would require too much effort, with no guarantee of improvements in patient safety. Although we do not know the degree to which hospitals did not participate because of anticipated IRB issues, at least one previous study suggests that this may be a barrier to research participation.[36] The effort involved in obtaining local IRB and R&D approvals was substantial, and many hospitals that did participate required assistance for these activities.

What about those hospitals that we did recruit? High-per-

Mean Recruitment Time by Hospital Characteristics (Department of Veterans Affairs Sample)

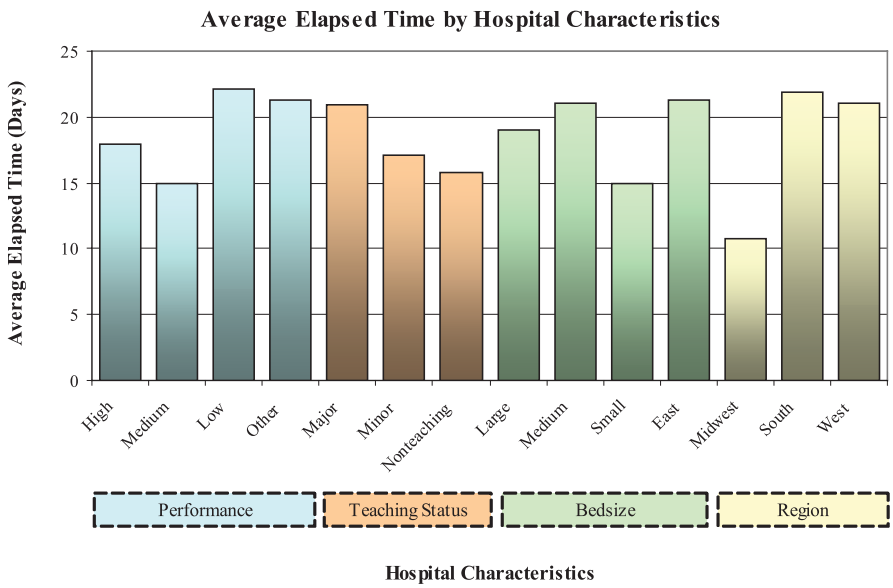

Figure 3. *The bar graph presents the average recruitment time by hospital characteristics, including performance, teaching status, bed size, and region.*

forming VA facilities were by far the easiest to recruit. Although such facilities were more likely to participate in the study, safety performance was not related to recruitment time. Region was significantly related to both participation and recruitment time. Hospitals in the East were more likely to be recruited successfully, and being a VA hospital in the Midwest was associated with a shorter recruitment time.

Organizational culture was significantly related to recruitment time (although not to participation). Specifically, hospitals with stronger entrepreneurial cultures had shorter recruitment times than those with other cultural orientations. A hospital with an entrepreneurial culture is characterized by its willingness to try new things and implement QI initiatives.[20,37,38]

More puzzling, however, was the finding that hospitals with higher levels of group-oriented culture were associated with longer recruitment time and no difference in recruitment. This contradicts literature that reports a positive association between group culture, QI efforts, and other positive outcomes.[20,38] We thus expected more group-oriented hospitals to be more interested in learning about their safety culture through participation in the present study. Another possibility is that hospitals with higher levels of group culture have longer recruitment times because their decision-making processes take longer. The "first come, first serve" nature of our stratified recruitment process may have deterred group-oriented latecomers. Further study is necessary to assess these hypotheses.

There were both similarities and differences between our results and those of our companion study. There was a significant association between region and recruitment and between entrepreneurial culture and recruitment time in both settings. Contrary to the VA study, the AHRQ study did not recruit on the basis of safety performance; recruitment was based only on size and region. Paradoxically, in the AHRQ study, low performers had the shortest recruitment times, although this relationship was related to hospital size. While the AHRQ study ended up recruiting hospitals with a fairly even distribution of PSI rates, recruiting by size and region alone cannot guarantee this.

Lessons Learned

This study not only reinforces the importance of selecting a representative sample of hospitals but provides critical new information on why recruiting the low performers is important despite difficulties in getting them to participate. Our findings suggest that, if we had sampled purely on a first come, first served basis, we might have obtained a subset of hospitals with strong entrepreneurial cultures and superior safety performance (that is, those most interested in learning about their safety climate). This would have omitted the poor performers—those most likely to benefit from studies of this kind. Researchers should thus stratify by measures of safety performance to avoid selection bias in studies of patient safety. Offering assistance to hospitals that have challenges managing IRB submissions and other administrative tasks may enable them to participate in safety-related studies. Also, providing free consultation about survey results and taking extra time and effort to specifically target the apparent poor performers would be worthwhile.

Our findings have practical implications for hospital organizations, leadership, and managers. Hospital organizations, such as the AHA, should contemplate providing financial

Appendix 1. Calculation of PSI Rankings and Performance Groups

We applied the Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicator (PSI) software (Version 2.1, Revision 2) to 2004 Department of Veterans Affairs (VA) hospital discharge data to rank hospitals on their PSI rates.[1] "Smoothed" (i.e., reliability-adjusted) PSI rates were used as the input to all factor analyses. Smoothed rates apply multivariate signal extraction (MSX) methods to estimate the amount of "noise" (i.e., variation due to random error) relative to the amount of "signal" (i.e., systematic variation in hospital performance or the reliability) for each indicator.[1,2] The one exception to this strategy was for the PSI "postoperative physiologic and metabolic derangements," which was calculated using the risk-adjusted rate as recommended by AHRQ.[1] The risk-adjustment methodology included age, gender, modified diagnosis-related groups (DRGs), and comorbidities based on the method developed by Elixhauser et al.[3]

As shown in Table A1 (page 283), the factor loadings demonstrated that two factors accounted for most of the correlation among the PSIs. Aggregated PSI rates (per 1,000 cases) for the first factor ranged from 0.0–8.49 for Q1; 8.5–11.62 for Q2; 11.63–14.99 for Q3; and 15–100 for Q4. For the second factor, rates ranged from 0–1.81 for Q1; 1.82–2.63 for Q2; 2.64–3.64 for Q3; and 3.65–8.65 for Q4. Nine PSIs (1, 4, 8, 9, 10, 11, 12, 13, 14) primarily associated with complications loaded highly on the first factor. The remaining six PSIs (2, 3, 5, 6, 7, 15), which related to problems arising from general medical/surgical care, loaded highly on the second factor. Despite the low factor loadings of "failure to rescue" (0.01692) and "death in low mortality DRGs" (-0.217889), clinical logic suggested that we group these into the first and second factors, respectively.

We calculated two overall PSI rates for each hospital based on the two groupings of PSI factor loadings. We then ranked hospitals based on their two PSI factor rates and divided each ranking into four quartiles (Q1, Q2, Q3, and Q4). Thus, each hospital had two rankings and two quartile assignments: one based on its complications PSI factor score, and the other based on its medical/surgical PSI factor score. Quartile 1 (Q1) represented those facilities with the lowest PSI rates ("high performers"), while those that had the highest PSI rates (Q4) were considered "low performers." On the basis of rankings, each of the 117 facilities was assigned to one of the following four groups:

1. High (Q1Q1, Q1Q2, Q2Q1)
2. Medium (Q2Q2, Q2Q3, Q3Q2, Q3Q3)
3. Low (Q4Q4, Q3Q4, Q4Q3)4.
4. "Other," which included the remaining six combinations (Q3Q1, Q1Q3, Q4Q2, Q2Q4, Q1Q4, Q4Q1).

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incentives to broaden the diversity of hospitals that are engaged in patient safety research. Accreditors, such as the Joint Commission, should consider providing mechanisms to reward participation in research studies, particularly for the low performers. Hospital leaders should embrace self-evaluation studies and actively encourage their organizations to engage in such efforts. Until such time, safety improvements and policies may continue to be aimed at hospitals that are mostly good performers striving to get better rather than at the ones that need to improve the most. J

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Table A1. Factor Loadings for Patient Safety Indicators (PSIs), Fiscal Year 2004*

		Factor Loadings†	
Medical or Surgical PSIs		**Factor 1**	**Factor 2**
1	Complications of Anesthesia	0.93098	0.01679
4	Failure to Rescue	0.01692	-0.31523
8	Postoperative Hip Fracture	0.93098	0.01679
9	Postoperative Hemorrhage or Hematoma	0.93098	0.01679
10	Postoperative Physiological and Metabolic Derangement	0.91154	-0.07730
11	Postoperative Respiratory Failure	0.91154	-0.07730
12	Postoperative Pulmonary Embolism or Deep Vein Thrombosis	0.93098	0.01679
13	Postoperative Sepsis	0.87228	-0.10048
14	Postoperative Wound Dehiscence	0.84591	-0.12444
Surgical PSIs		**Factor 1**	**Factor 2**
2	Death in Low Mortality DRGs	-0.06162	-0.21789
3	Decubitus Ulcer	0.06314	0.36145
5	Foreign Body Left in During Procedure	-0.08547	0.45037
6	Iatrogenic Pneumothorax	-0.14505	0.62201
7	Infection Due to Medical Care	-0.10593	0.74905
15	Accidental Puncture or Laceration	-0.09536	0.81267

* Five PSIs were eliminated from analyses (4 were obstetric and not relevant to the Department of Veterans Affairs, and one, "transfusion reaction," occurred so rarely that it was not meaningful to combine it with other PSIs. DRG, diagnosis-related group.

† A principal component method with Varimax rotation was used for all analyses.

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